Using a Systems Approach to Project Communications Management

Tony Lindeman, PMP
Senior Systems Engineer
Westar, Aerospace & Defense Group, Inc.
philip.a.lindeman@msfc.nasa.gov

Purpose

- To gain an appreciation of the role of communication management in managing successful projects
- To propose using systems engineering approach to deploy a Project Management Information System (PMIS)

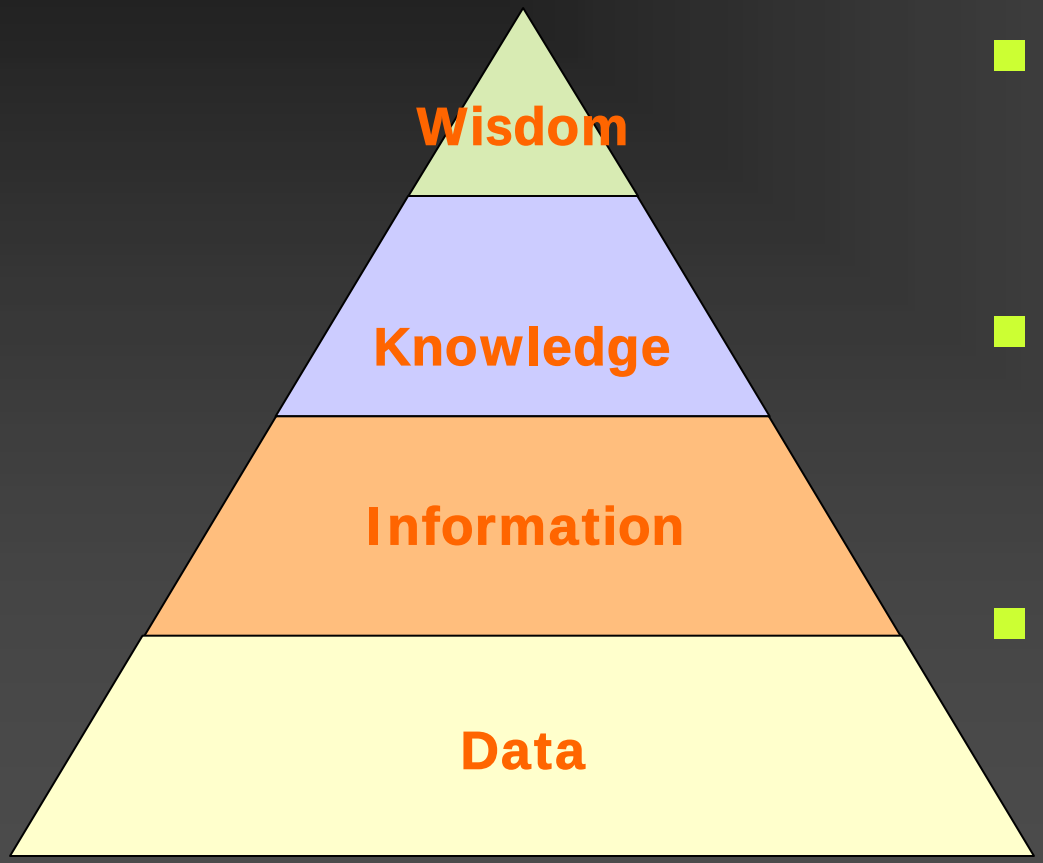
"Where is the wisdom we've lost in knowledge? Where is the knowledge we've lost in the information?"

– T.S. Eliott

Agenda

- Project Communication Management Overview
- Systems Engineering Process Goals
- Project Hierarchies
- Measurements and Metrics
- Project Management Information Systems (PMIS)
- Communication Planning

Knowledgeable Decision Making



- Knowledge
  - Communicated information + experience
- Information
  - Patterned data
  - Analysis & structure
- Data
  - Dispersed elements
  - Measurements

Top 10 Reasons Why Projects Fail?

- Inadequately trained and/or inexperienced project managers
- Failure to set and manage expectations
- Poor leadership at any and all levels
- Failure to adequately identify, document, and track requirements
- Poor plans and planning processes
- Poor effort estimation
- Cultural and ethical misalignment
- Misalignment between the project team and the business or other organizations it serves
- Inadequate or misused methods
- **Inadequate communication, including progress tracking and reporting**

Source: gantthead.com, 2003

Communication Management

- PMI® Project Management Body of Knowledge (PMBOK®) Knowledge Area
- PM Critical Success Factor
  - Provides timely information required for making efficient and effective management decisions
  - Provides mechanism for disseminating management decisions
- Challenges
  - Timeliness
  - Accuracy
  - Ability to integrate information

Current Situation (Basis of Need)

- Increase use of web-based applications
- Gov't mandated management initiatives
  - EVMS
  - Risk management
  - Key Performance Parameters (KPPs)
  - etc.
- Various metrics required to status product, process, and progress and proactively control the potential for scope growth

Definitions

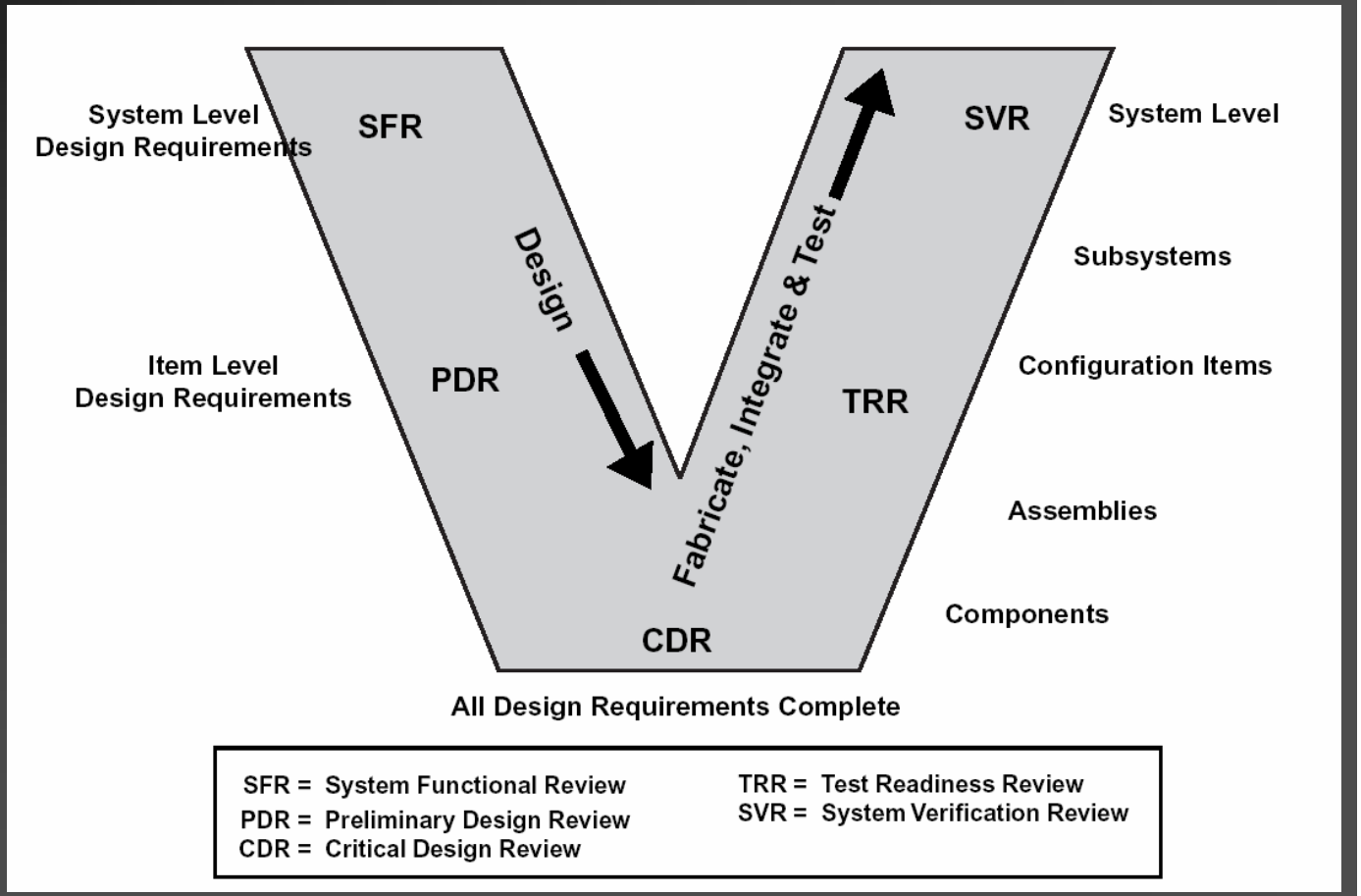
- System – an integrated set of elements that accomplish a defined objective. These elements include products (hardware, software, firmware), processes, people, **information**, techniques, facilities, services, and other support elements.
- Systems Engineering – An interdisciplinary approach and means to enable the realization of successful systems.

Systems Engineering Process Goals

- System decomposition and design
- System integration and verification
- System-of-System integration

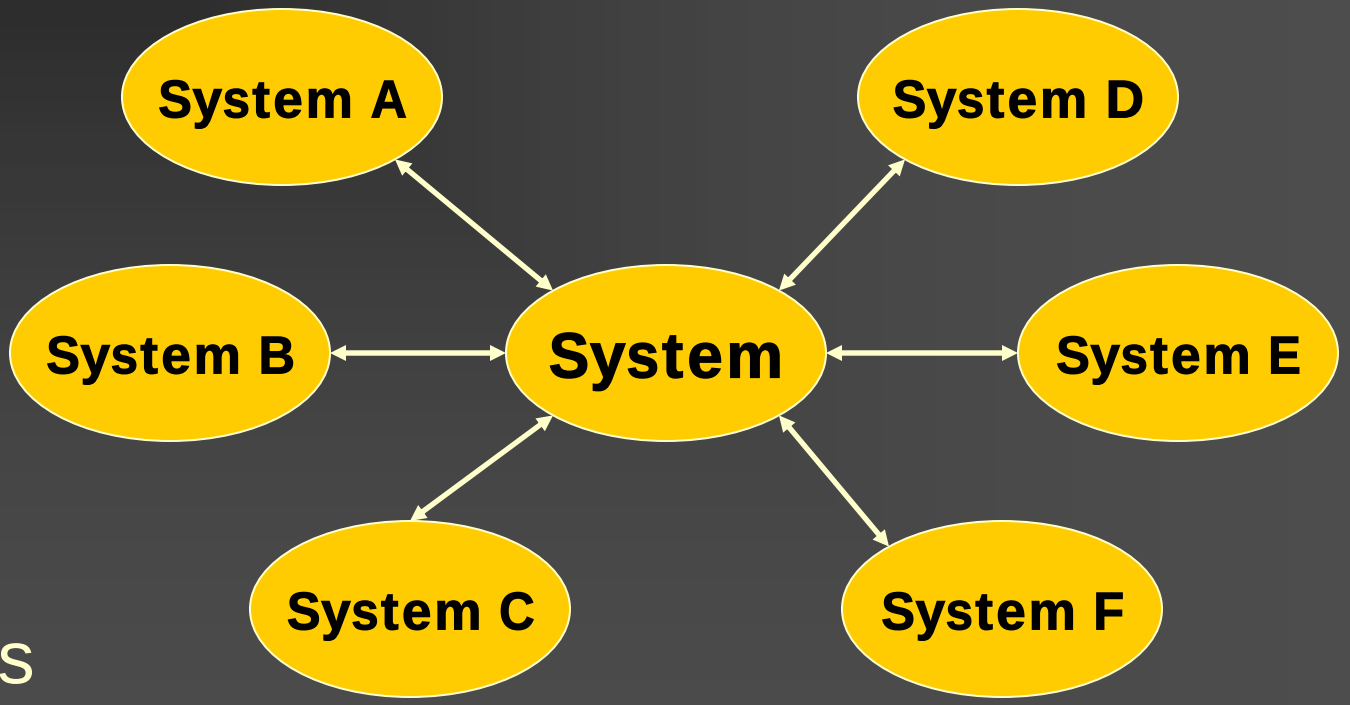
Systems Engineering “Vee” Diagram

- Decompose
- Design
- Integrate
- Verify



System-of-Systems Integration

- Define System Architecture
- Manage Integration through Interface Control Specifications (ICSs)



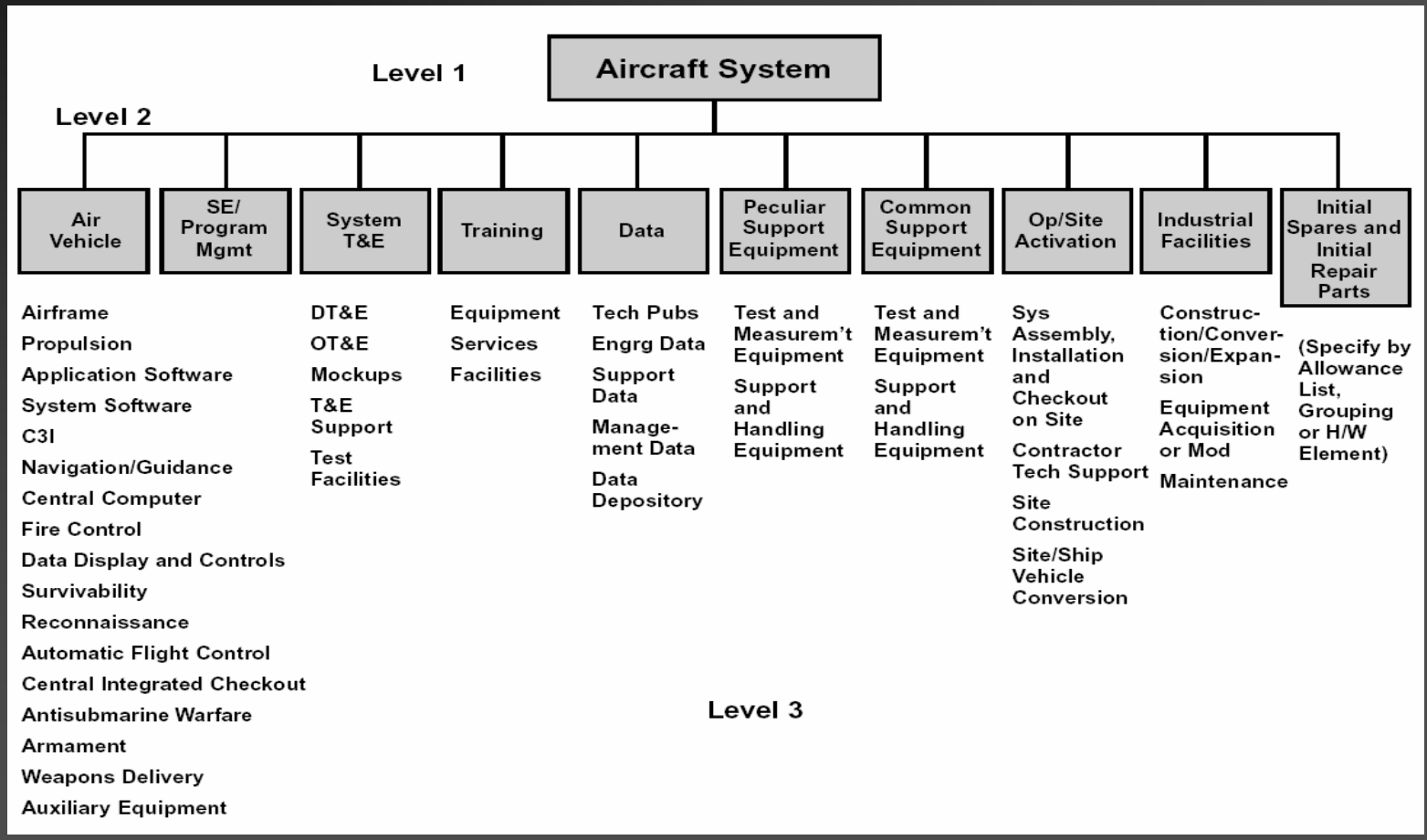
Project Hierarchies

- Product-based Work Breakdown Structure (WBS)
- Product-based Integrated Product Team (IPT) Organization
- Product-based Specifications
- Risk Breakdown Structure

Project Hierarchies

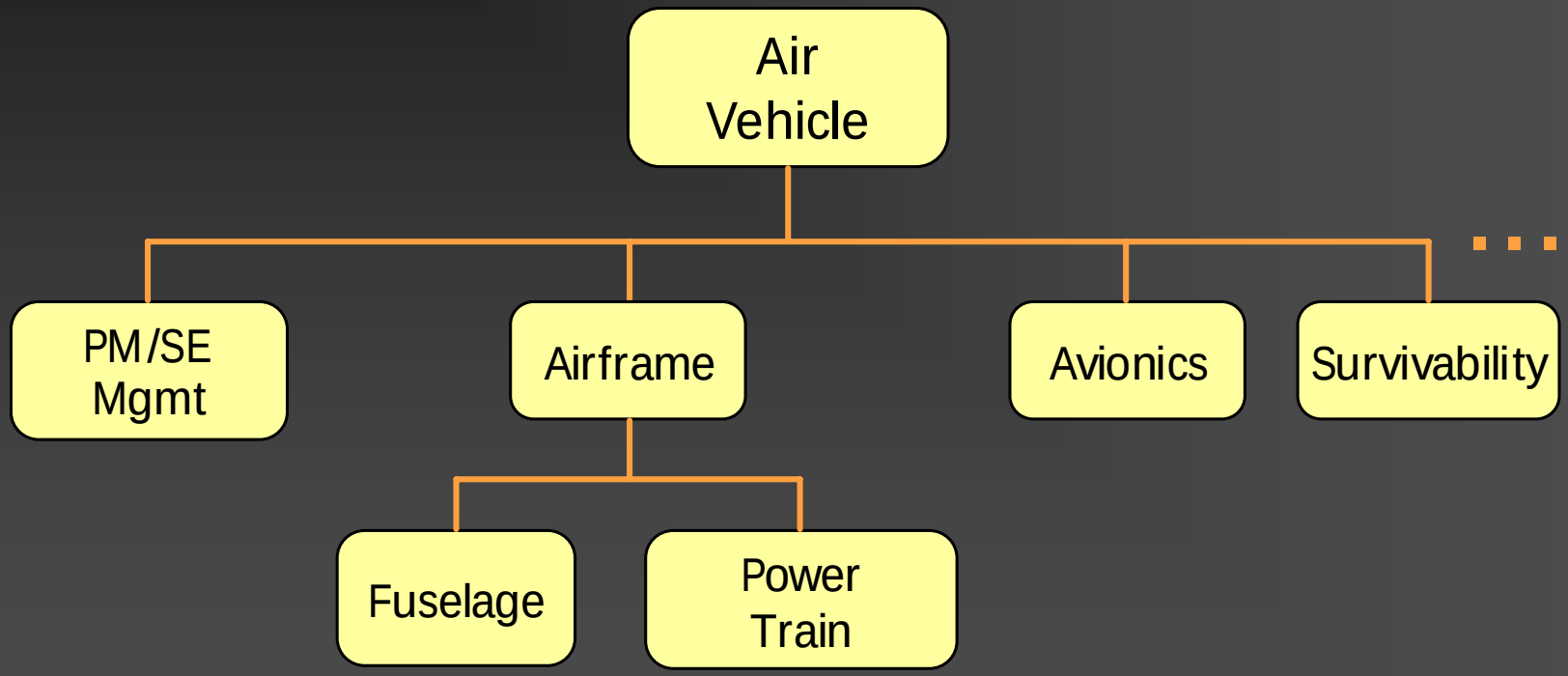
- Work Breakdown Structure (WBS)
  - Derived from project scope
  - Foundation for EVMS implementation
  - Resource loaded to create work packages
  - Work packages for IMP/IMS
  - IBR provides initial assessment of implemented plans
- IPT Organization
  - Product-based
  - Multi-disciplinary

Aircraft System WBS

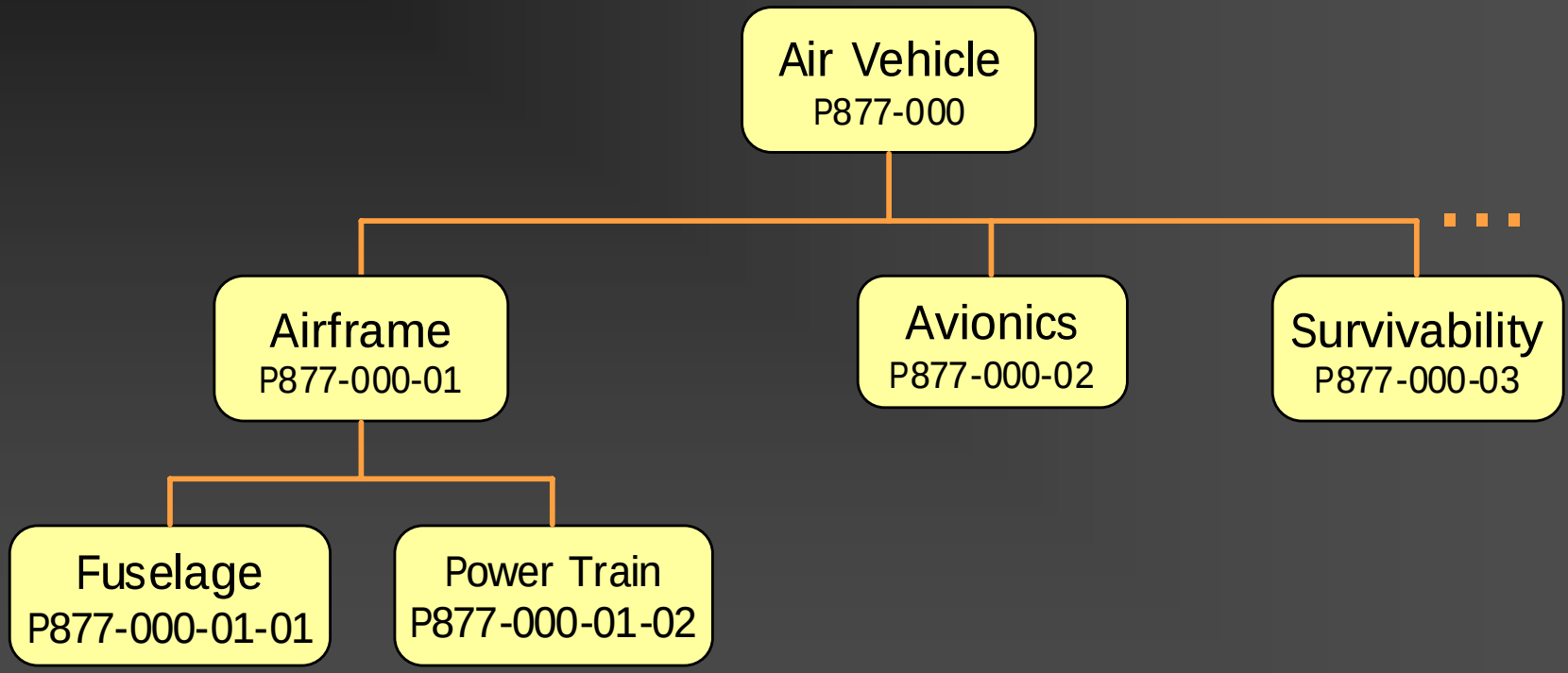


Reference: DoD Work Breakdown Structure (WBS) MIL-HDBK-881

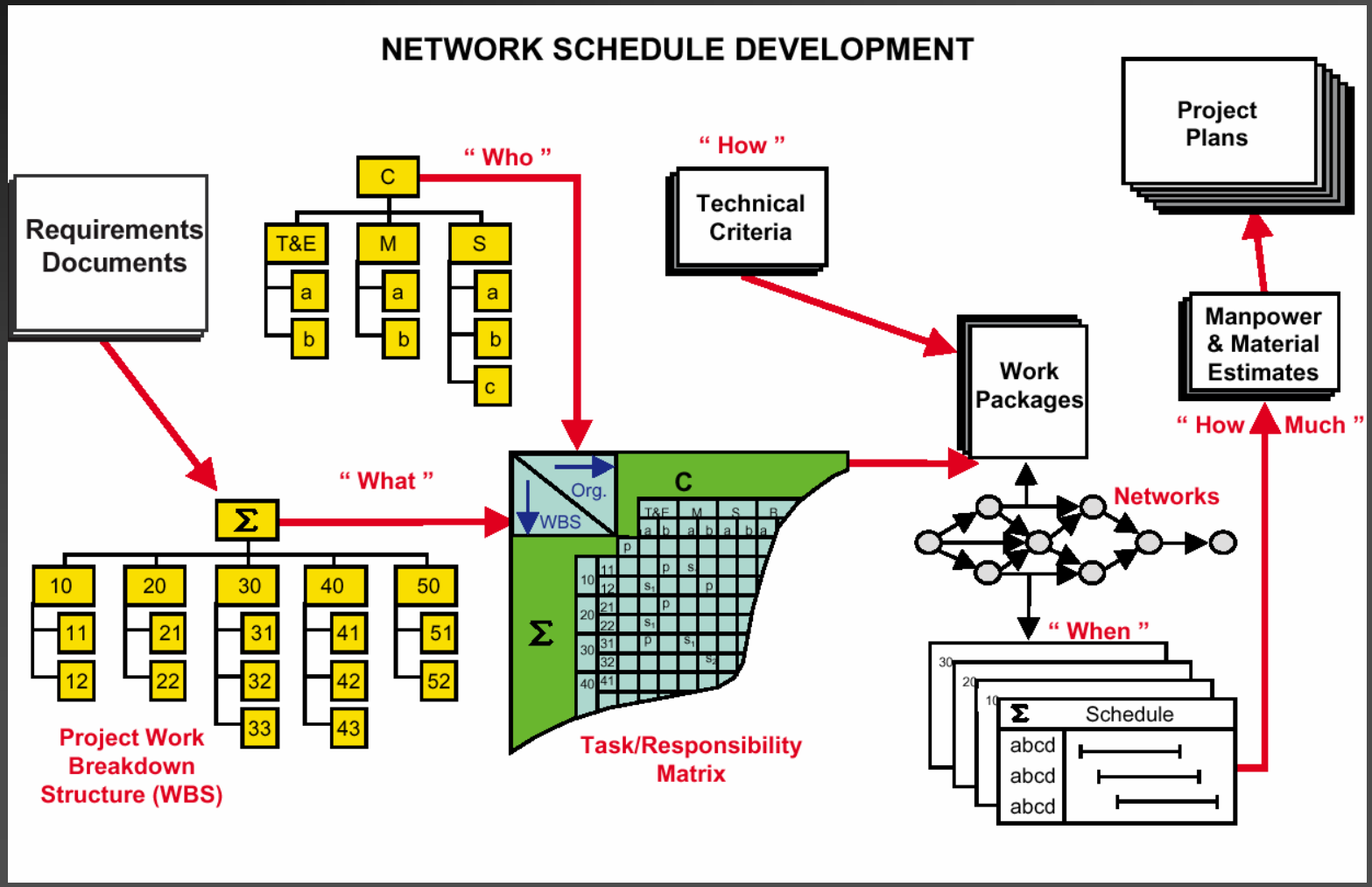
Aircraft System IPT Organization



Air Vehicle Specification Tree



Network Schedule Development



Ref: DAU PM Toolkit, Dec 2002

Measurements & Metrics

Integrating Information Analogy

1. Constant power
2. Steady altitude
3. Steady heading
4. Steady airspeed
5. VSI steady
6. No sideslip
7. Wings level
8. Steady pitch

Microsoft® Flight Simulator 2002

Recovery Response

“Without adjusting power setting, recover by lowering nose to regain airspeed and descend to desired airspeed and altitude”

1. Constant power
2. Altitude higher
3. Constant heading
4. VSI - 500 ft/sec rate of climb
5. No sideslip
6. Wings level
7. Nose-up pitch

Microsoft® Flight Simulator 2002

Metric

- Definition

  "A measurement taken over a period of time that communicates vital information about a process or activity. A metric should drive appropriate action."

  NASA NPR 7120.5B,
  NASA Program and Project Management Processes and Requirements

Measurements & Metrics

- Lynchpin to making and providing timely, effective, & efficient management decisions and direction
- Management decisions based on information derived from measurement data
- Types of measurements
  - Process
  - Progress
  - Product
- Measurements create data that can be organized to generate hierarchal information

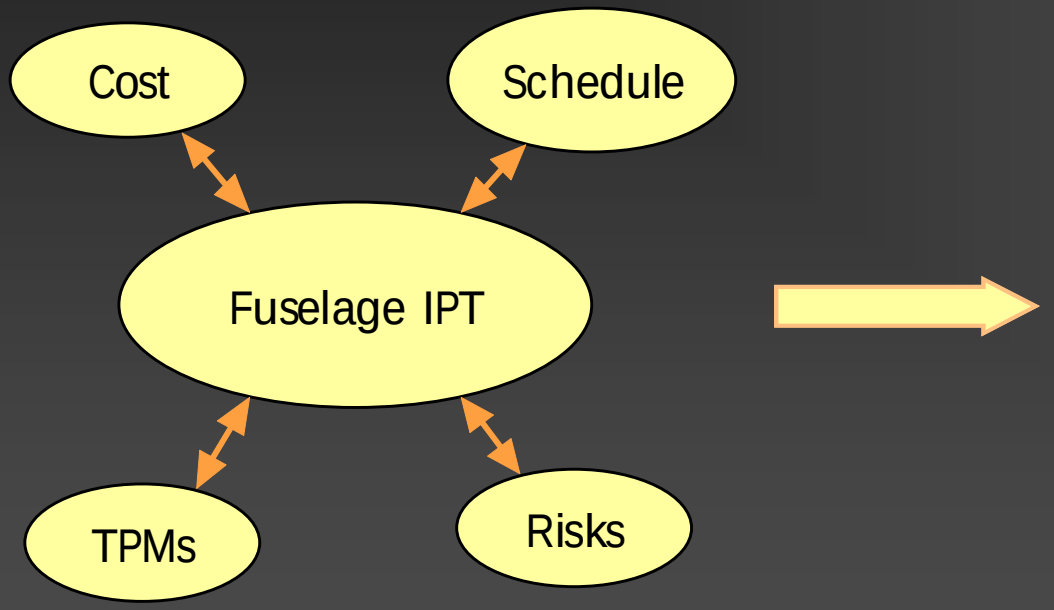
Metric Attributes

- Presents useful data to support decision making process
- Sustaining value over time
- Supports desired outcome
- Timely and pertinent to stakeholder(s) at all levels

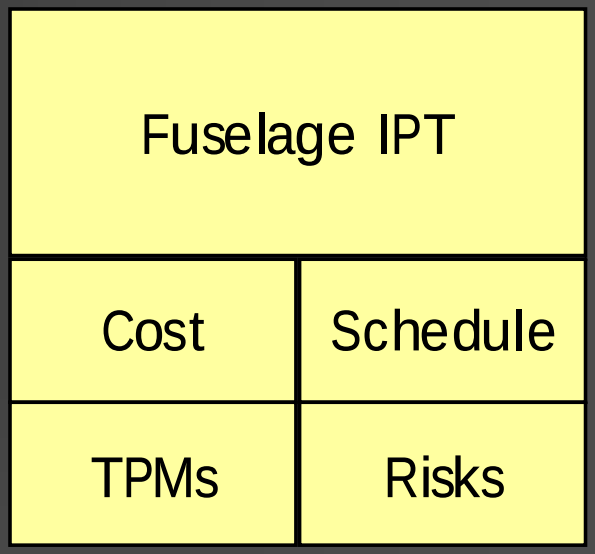
EVMS is effective because…

- System-level Cost Performance Index/Schedule Performance Index (CPI/SPI) is derived from a roll-up of lower level work packages
- Top-level numbers are only as good as the quality of the planning at the lowest levels
- Management has to be effective and efficient at all levels to enhance success

Integration of Information

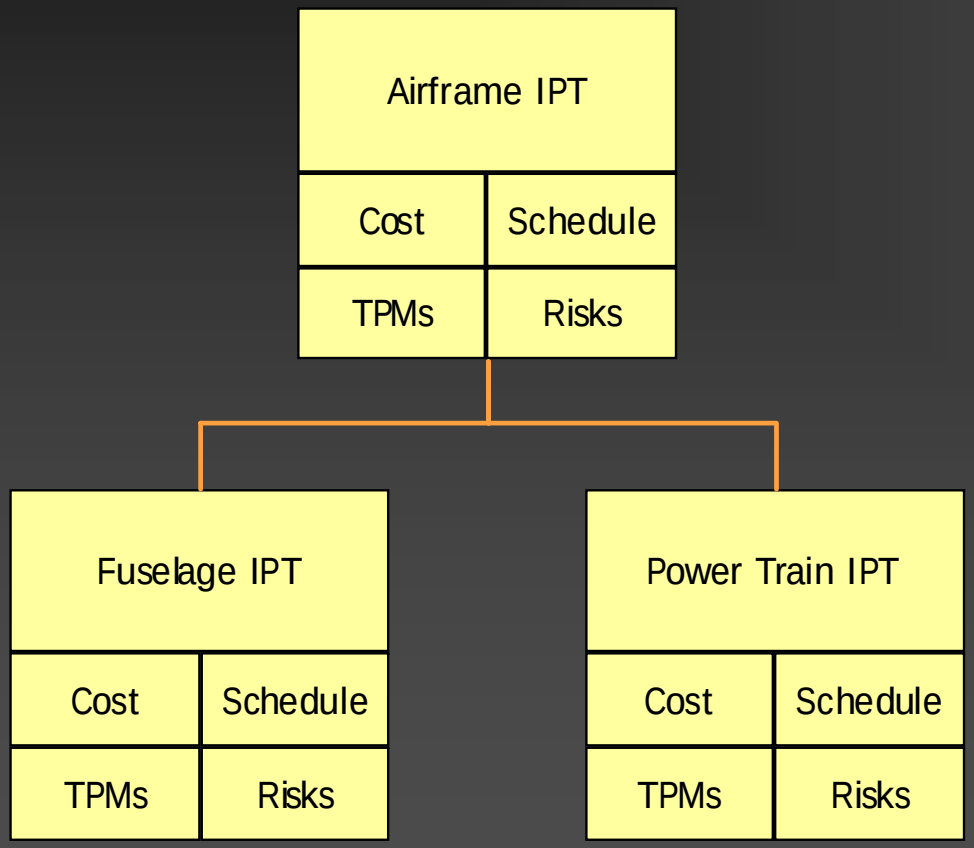


Integration begins at lowest IPT level



Integrated Dashboard Display

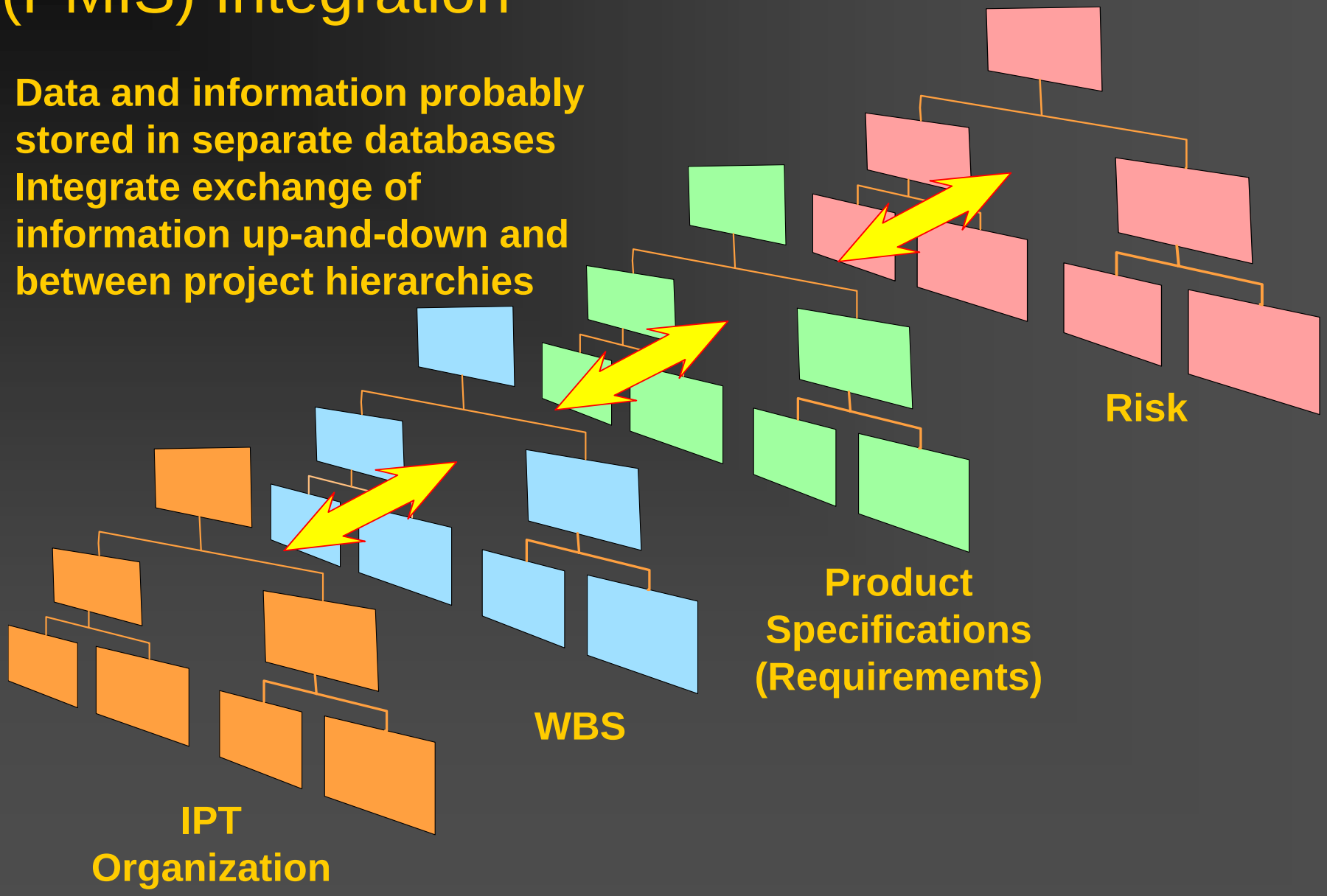
Linking Information



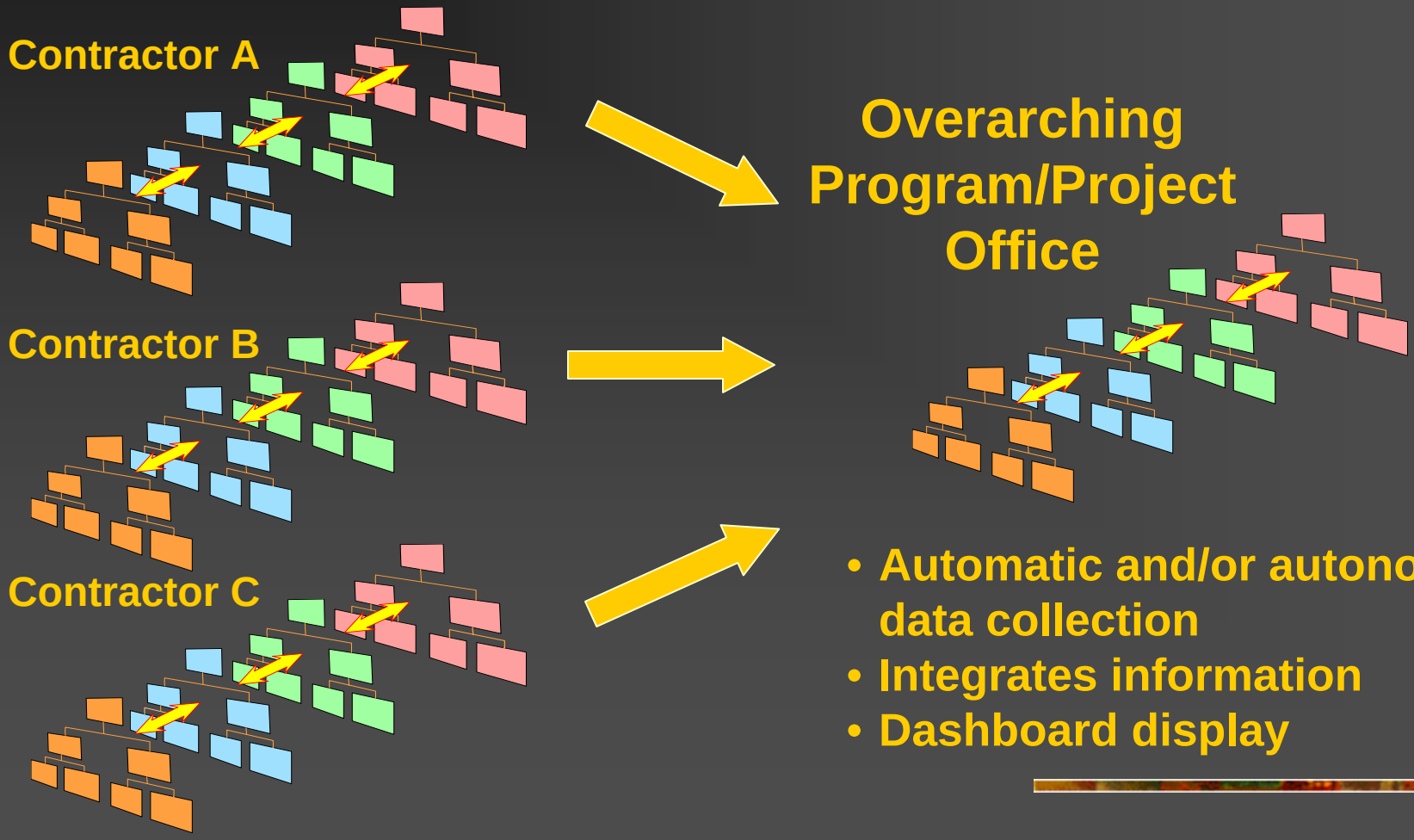
- Airframe Weight
  - TPM
  - Cost
  - Schedule
  - Risks

Project Management Information System (PMIS) Integration

- **Data and information probably stored in separate databases**
- **Integrate exchange of information up-and-down and between project hierarchies**



System-of-Systems Integration



- Automatic and/or autonomous data collection
- Integrates information
- Dashboard display

Project Management Information System (PMIS)

- Qualifies as a “System”…an integrated set of elements that accomplish a defined objective
- Command center lay-out
  - Near real-time displays of information
  - Allows corroboration of information
  - Early-warning indicators if exceeding acceptable range of parameters
  - Deploys management decisions
  - Same system provides management decision feedback
- Collects output of specialized software
- Repository of metrics and information normally collected by a program/project

Program Control System (PCS) Demonstration

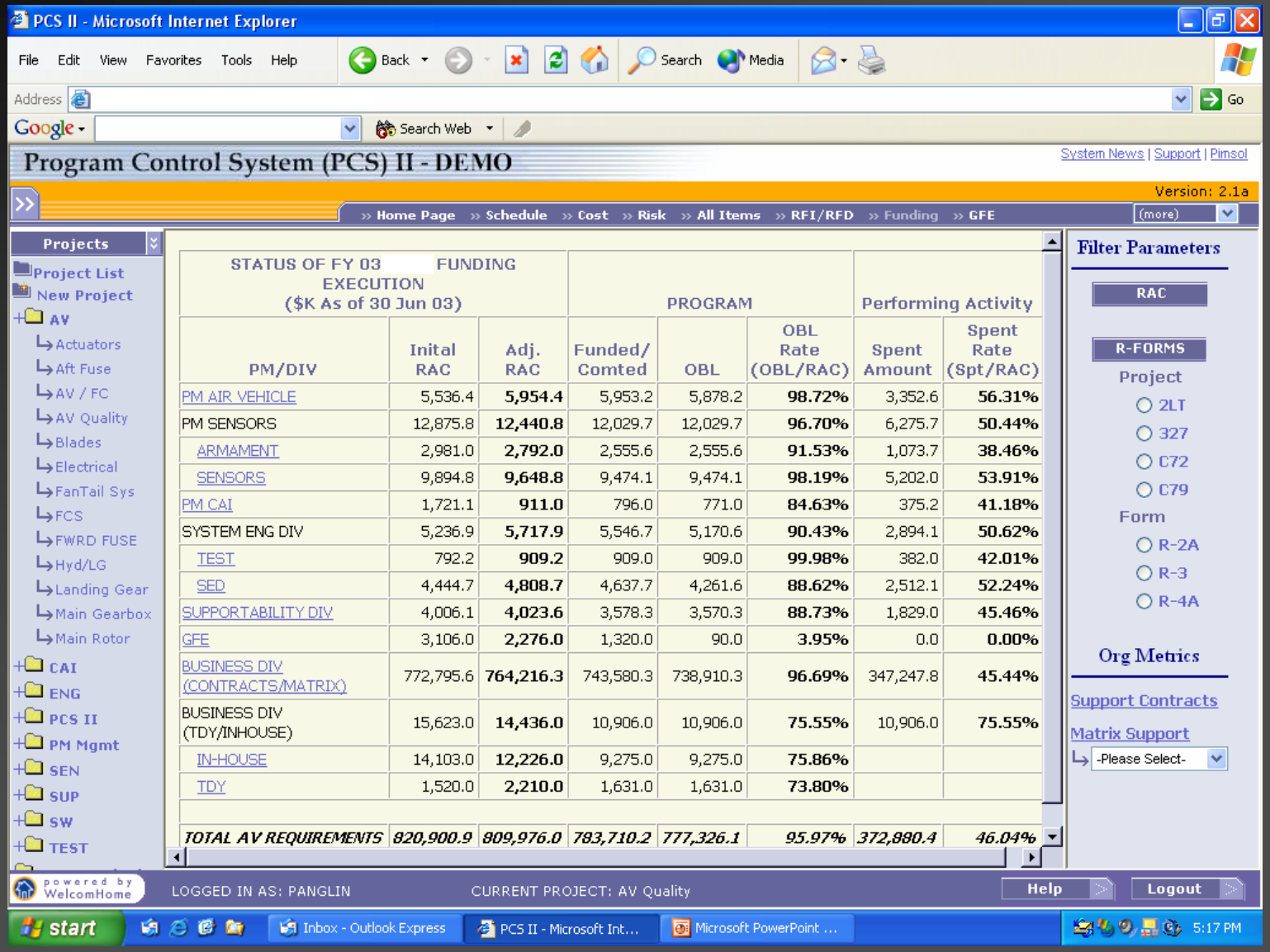
Program Control System (PCS)

- Combined hierarchal IPT structure and information requirements
- Automated or autonomous data collection
- Dynamic and adaptable
  - Evolving refinement
  - Adapts to Program/Project Phase requirements
- Exception reporting – “only what’s changed”
- Integrates management initiatives & goals

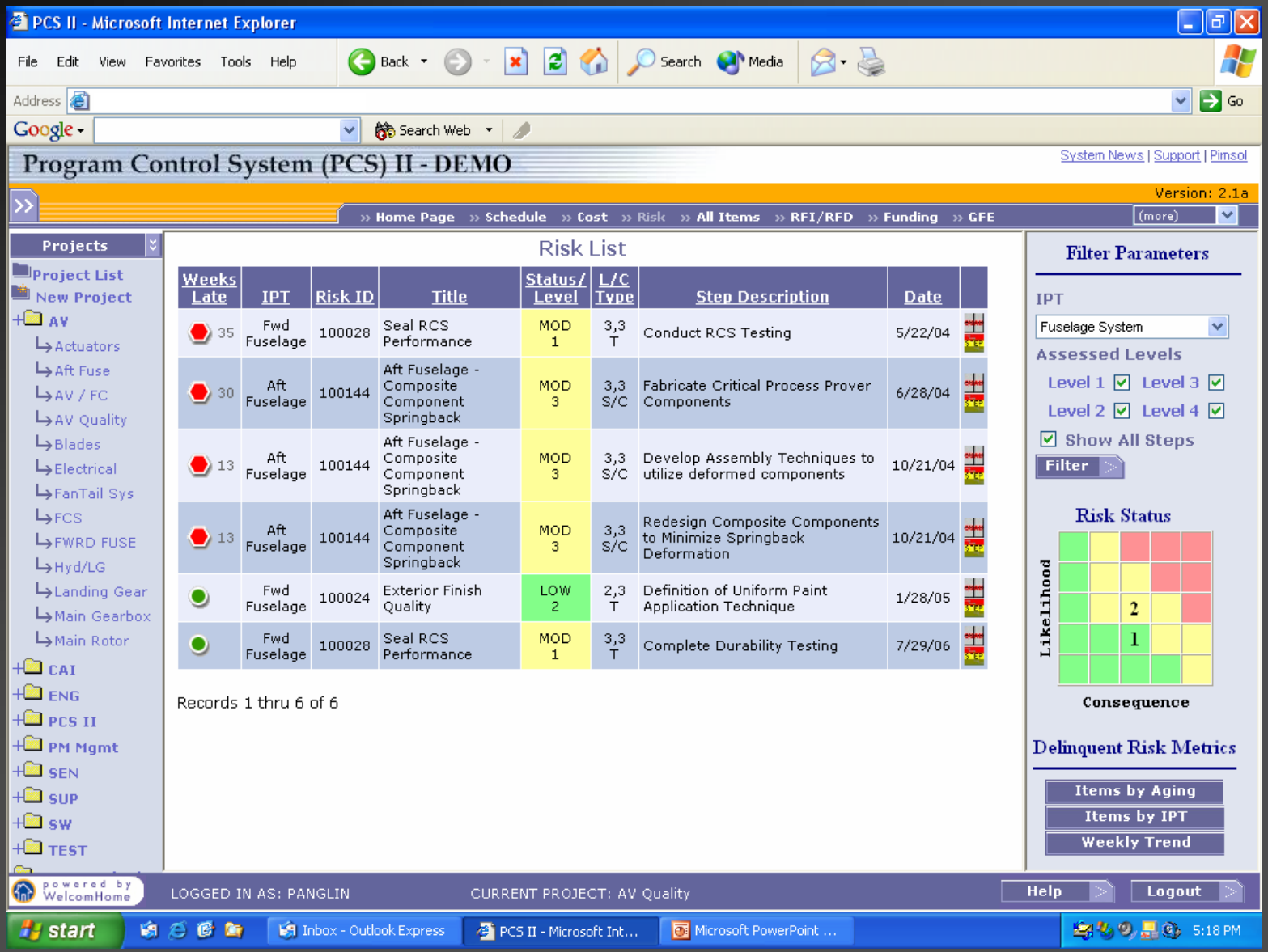
Program Control System (PCS) IPT Homepage

IPT Cost Status webpage

IPT Financial Status webpage



IPT Risk Management Status webpage



PMIS Benefits

- Consistent management process throughout organization
- Standardized reporting
- Develop PM and IPT Lead proficiency
- Central repository
  - Decision making information
  - Management decisions
- Evaluate efficiency & effectiveness of management decisions

Communication Planning

Communication Planning

- Origin in Project Formulation Phase
  - Project Charter
  - Directives Review
  - Stakeholder Analysis
- Communication Management Plan
  - Part of Project Management Plan
  - Covers all forms of communication
  - Defines top level communication requirements
  - Additional detail in lower level management plans

Communication Planning Process

- Employ SE process
  - Flow-down & roll-up traceability
  - Integration of project hierarchies
- Measurements & metrics
  - Project status
  - Feedback loops to assess efficiency & effectiveness

PMIS Requirements

- Autonomous/automatic data harvesting
- Integrates data
  - Horizontally
  - Vertically
- Corroborates information
- Synchronizes information
- Color coding
- Standard management reports

Metric Profile

- Metric Title
- Metric Description
  - Type…progress, product, or process
  - Derivation from program/project goals & objectives
  - Uses
- Responsible Organization
- Measurement inputs & constraints
- Start/End dates
- Timeliness…or when is data no longer useful
- Frequency…or how often is measurement taken
- Automatic or autonomous collection
- Metric output – where does it go?

Communication “System”

- Communication requirements associated with every project
- Process, progress, & product metrics
- Traceability through flow-down & verification (rollup)
- Integrate information to create dashboards for a particular level of management
- Communicate management decisions and associated impact(s)

Summary

- Greater emphasis on communications and measurement planning during program/project formulation phase
- Enhance management decision-making process
- Employ Systems Engineering techniques
  - Structured process in making complex management decisions
  - “Things either flow-down or roll-up” to ensure traceability and verifiability
  - Integration of systems at all levels to exchange information